AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

SCIENCE

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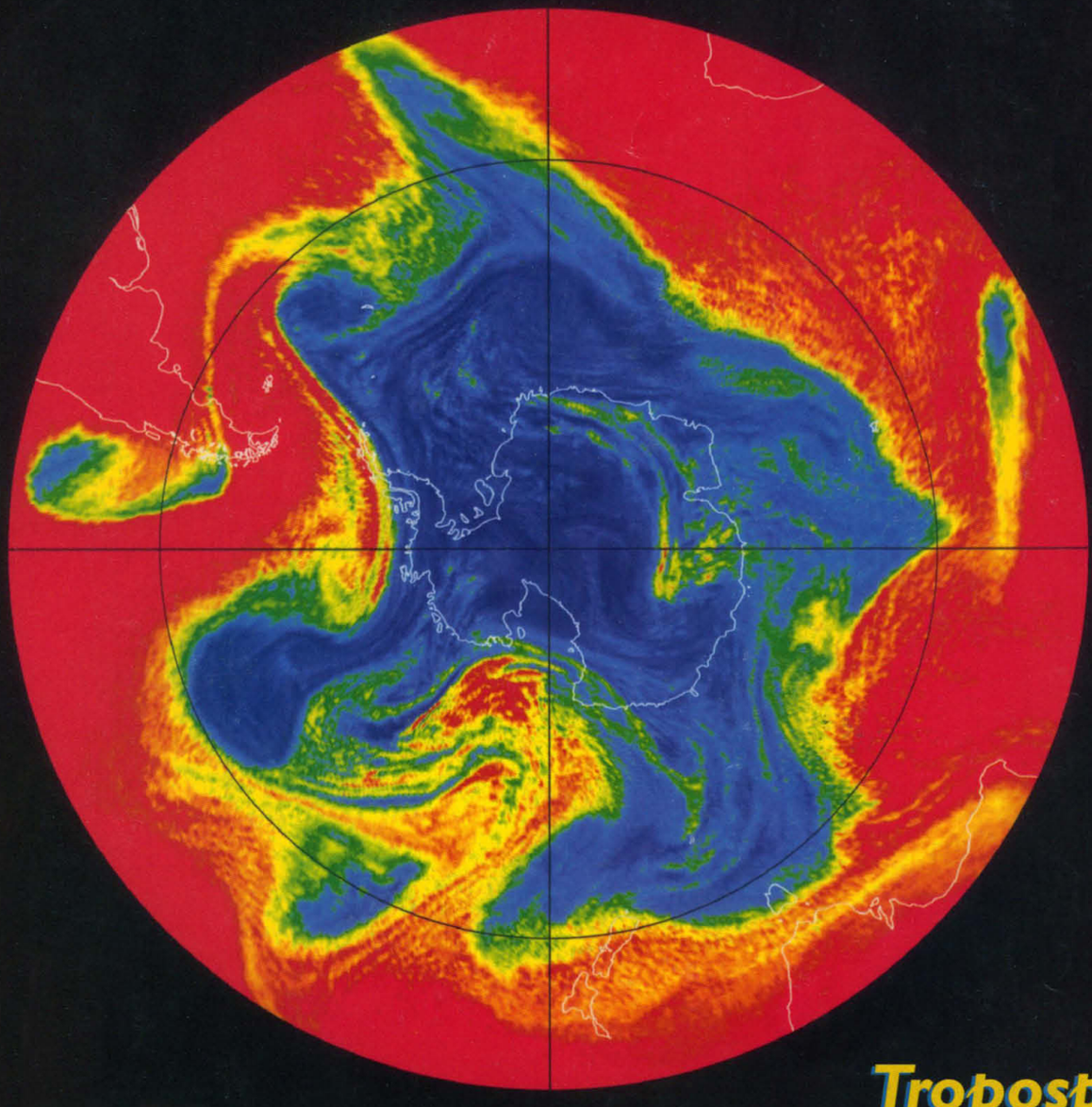

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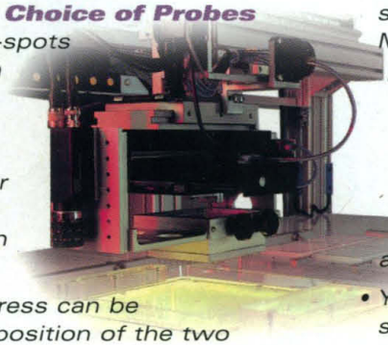

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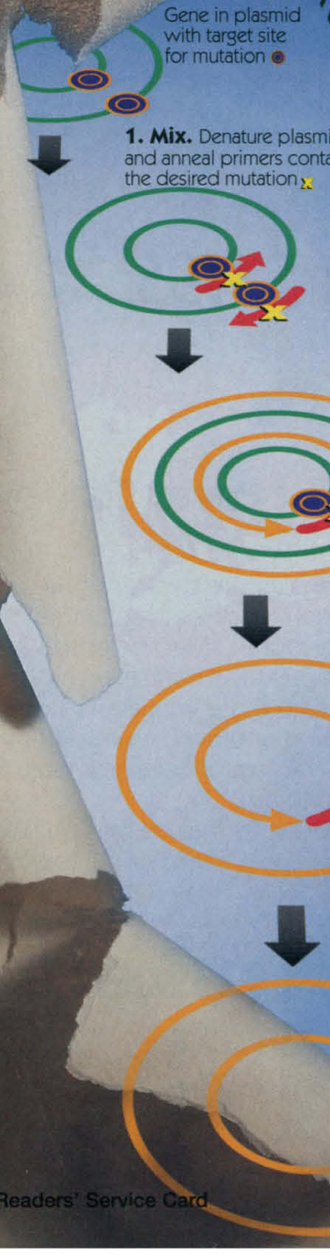

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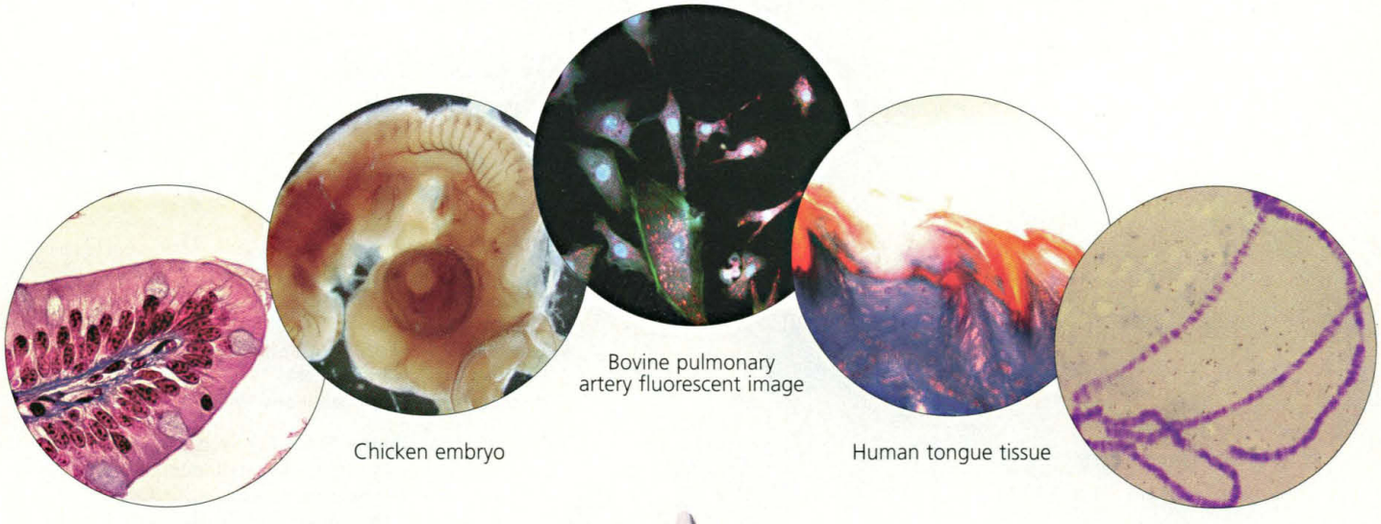

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Bovine pulmonary artery fluorescent image

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All images were captured at 1280 x 1024 pixels with a Pixera Professional Digital Camera mounted on a microscope with a standard C-mount adapter.

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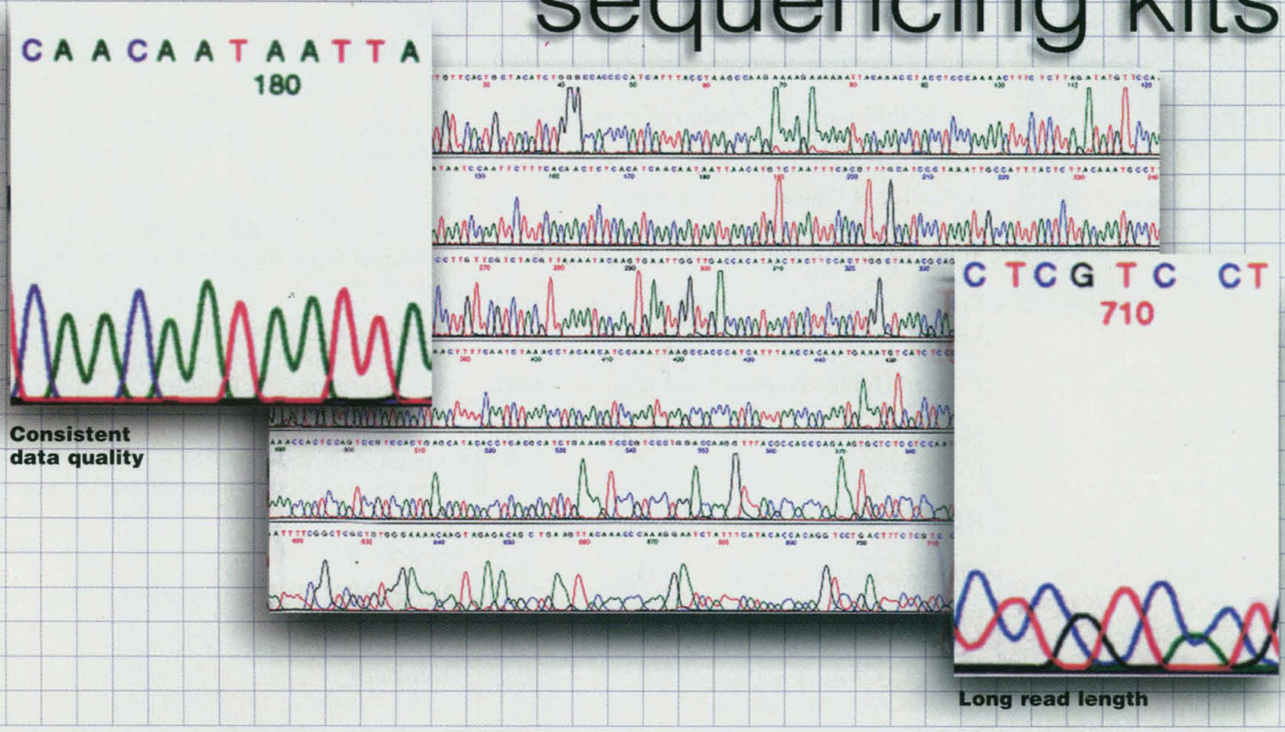

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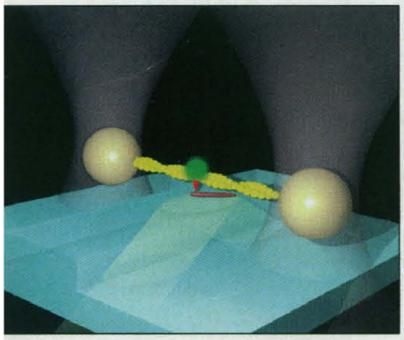
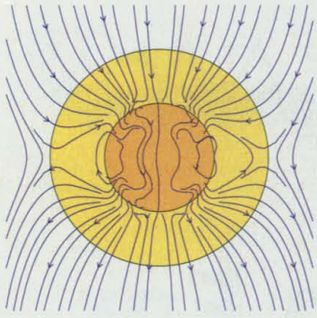
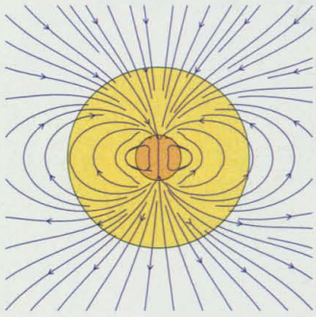


1027
Spying on myosin's moves





1106
Dynamic dynamos?

NEWS & COMMENT

RESEARCH NEWS

TROPOSPHERIC PROCESSES

NEWS

ARTICLES

PERSPECTIVES

DEPARTMENTS

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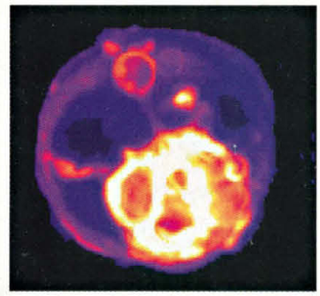
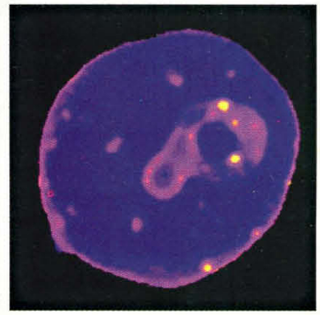
COVER

Simulated mixing ratio of atmospheric nitrous oxide on the Southern Hemisphere 320 K potential temperature surface. Continental boundaries are indicated in white. The sharp gradient on nitrous oxide (blue edge) marks the meandering jet stream and the boundary between the stratosphere (blue) and the troposphere (red and yellow). See page 1079 and the special section on tropospheric processes beginning on page 1039. [Image: J. D. Mahlman]

REPORTS

TECHNICAL COMMENTS





1031 & 1122
Networking for food

◩ Indicates accompanying feature

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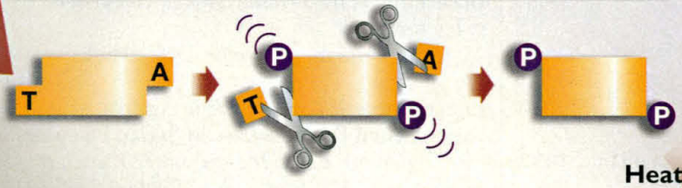

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- Compatible with PCR products generated by proofreading polymerases (*e.g., Pfu*)
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- No addition of exogenous sequences to PCR primers
- No restriction enzyme digestion

References

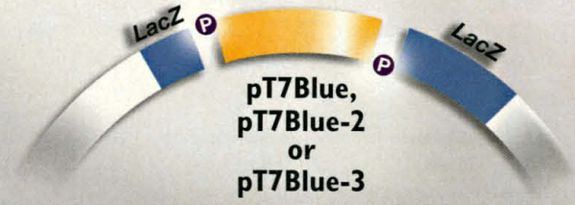
1. Brownstein, J.M., *et al.* (1996) *BioTechniques* **20**, 1004–1010.
2. Magnuson, V.L., *et al.* (1996) *BioTechniques* **21**, 700–709.
3. Novy, R.E., Yaeger, K.W., and Kolb, K.M. (1996) *In**Nova**tions* **6**, 7–11.

*The Polymerase Chain Reaction (PCR) process is covered by patents owned by Hoffmann-La Roche.

†Conditions that use DNA polymerases lacking 3'→5' exo-activity (*e.g., Taq, Tth*)

Homogeneous Product, Blunt and Phosphorylated

Ligation Reaction



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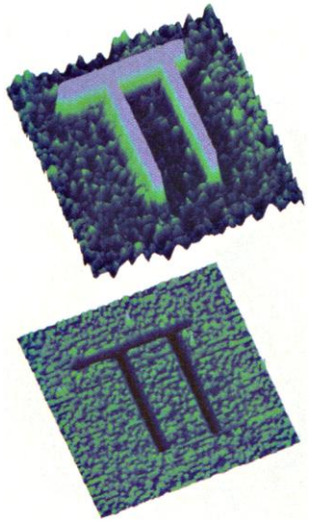
THIS WEEK IN SCIENCE

edited by PHIL SZUROMI

Reversible writing

Ferroelectric materials are of interest for device construction because their characteristic polarization field, which can be reversed, remains after power is shut off to the circuit. Ahn *et al.* (p. 1100) show that micrometer-size areas of different polarizations could be written



into high-quality heterostructures of lead strontium titanate and strontium ruthenate. A metallized atomic force microscope tip, scanning in a noncontact mode, provided the local electric field for changing the polarization in these ferroelectric films.

■

Saturated x-ray lasers

Practical applications of x-ray lasers would require that their output be saturated so that they are stable and produce the maximum operating power. Many of the materials used for the plasmas that produce the x-rays require steep increases in driving laser power for wavelengths below 10 nanometers. Zhang *et al.* (p. 1097) demonstrate an efficient saturated samarium x-ray laser operating at 7 nanometers. A low-intensity laser prepulse is used to produce a more uniform plasma for the main excitation laser pulse.

■

Delaying a model prion disease

Protease-resistant forms of prion proteins (PrPres) are thought to be involved in Creutzfeldt-Jakob disease in humans and the spongiform encephalopathies of cattle that appear to have recently spread to human populations. The structure of PrPres has features that resemble those of amyloid proteins. A derivative of doxorubicin, IDX, has previously been used to treat patients with different cancers and has been shown to bind strongly to amyloid fibers. In a model system for prion diseases, experimental scrapie induced by injection of brain material into Syrian hamsters, Tagliavini *et al.* (p. 1119) show that symptoms of disease were delayed if the animals were simultaneously treated with IDX.

Wetter, but when?

Chondrites are thought to represent the most primitive materials found in meteorites, and carbonaceous chondrites have exhibited inclusions of relatively rare hydrous mineral phases. Brearley (p. 1103), using high-resolution transmission electron microscopy, has found more abundant and widespread hydrous phases that replace pyroxenes along fractures in seven carbonaceous chondrules from the Allende meteorite. The author discusses whether this aqueous alteration occurred in the preaccretionary, nebular stage or while the chondrules resided on the meteorite's parent body.

■

Galilean dynamos

Data from the magnetometer on board the Galileo orbiter has indicated that two of the jovian satellites, Io and Ganymede, have intrinsic magnetic fields. Sarson *et al.* (p. 1106) performed two-dimensional magnetohydrodynamic simulations and found that Ganymede's field is probably produced by its own dynamo, suggesting that the largest of the Galilean satellites has internal convection. For Io, which has active volcanism (considered to be a surface expression of a convecting interior) and also orbits closer to Jupiter than Ganymede, the simulations cannot distinguish between an internal dynamo or generation of Io's field by the ambient jovian magnetic field.

■

Titin tightness

Individual molecules of titin, a component of striated muscle, are of the order of a micrometer in length and are thought to provide a passive restoring force as muscles elongate. How is this force generated and what is its magnitude? Rief *et al.* (p. 1109), using atomic force microscopy, and Kellermayer *et al.* (p. 1112), using laser tweezers, measured the mechanical properties of single titin molecules (see the Perspective by Erickson, p. 1090). Pulling extends the molecule in 25-nanometer increments, corresponding to the stepwise unfolding of tandemly arrayed immunoglobulin domains, and the measured forces depend on the rate of extension, approaching several hundred piconewtons at an extension rate of 1 micrometer per second. Release or relaxation allows both for rapid refolding and for the measurement of entropic elasticity. Scaling these data to macroscopic dimensions reproduces measurements made on whole muscle fibers.

■

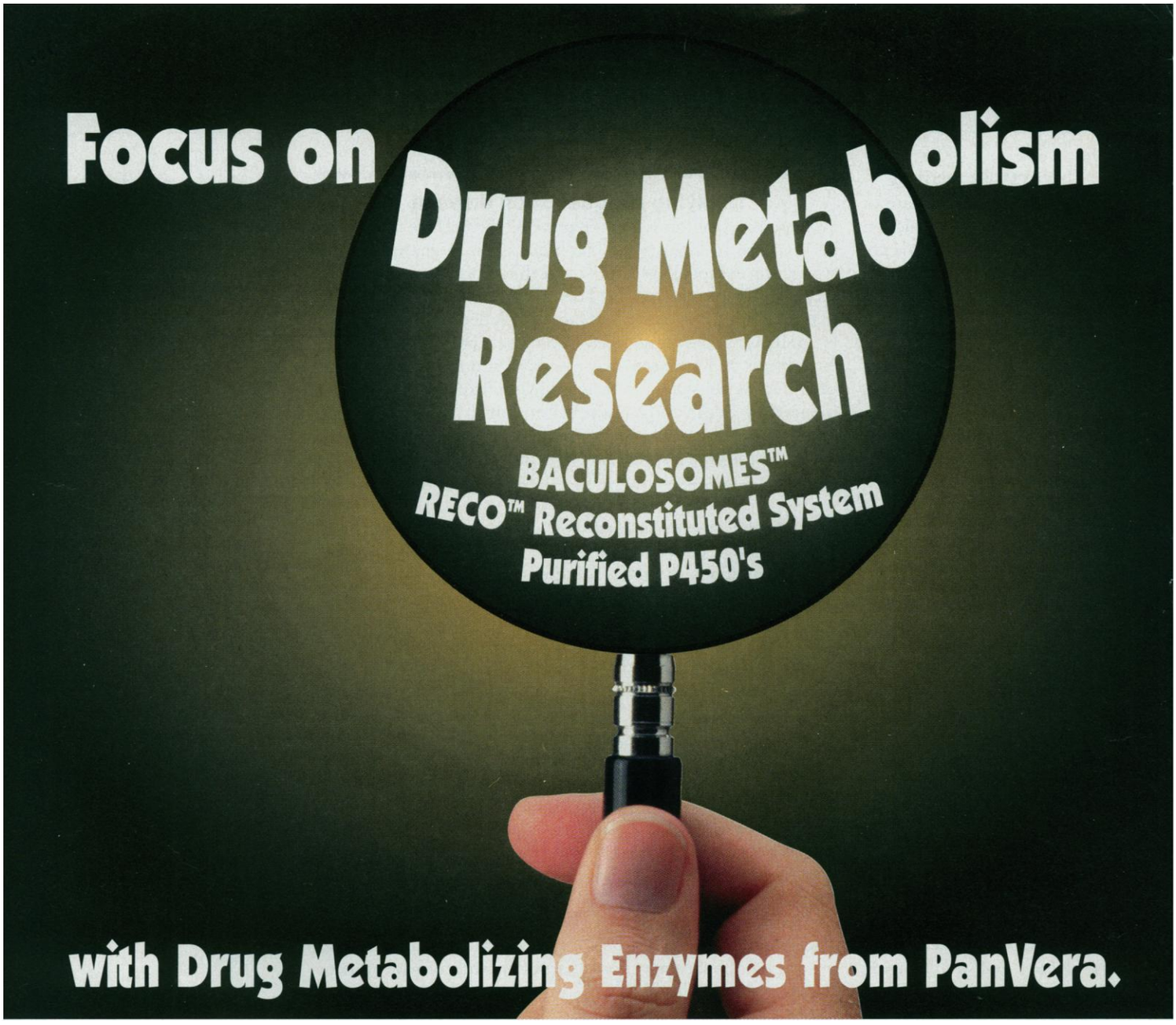
Laying down plans

The basic axes of the vertebrate body plan are established early in oogenesis, when RNA molecules are localized to specific regions of the oocyte. The localized RNA molecules then remain quiescent, awaiting later times in development to be translated into protein. In the frog, *Xenopus*, one of the more important RNA molecules encodes Vg1, a growth factor that directs mesoderm development. Deshler *et al.* (p. 1128; see the Perspective by Etkin, p. 1092) show that localization of Vg1 mRNA to the oocyte's vegetal pole involves interaction with a protein named Vera and an association with a specialized fraction of the endoplasmic reticulum.

■

Cell stickers

Oligosaccharides on cell surfaces can be chemically modified to present unusual functional groups for recognition or reaction. Mahal *et al.* (p. 1125) incorporated an unnatural derivative of *N*-acetylmannosamine bearing a ketone group into cells, where it was converted metabolically into a cell surface molecule. The ketones could be used to attach a biotin tag to the cell; this in turn allowed selective lethal targeting of cells with a ricin A chain attached to avidin, which binds to biotin.



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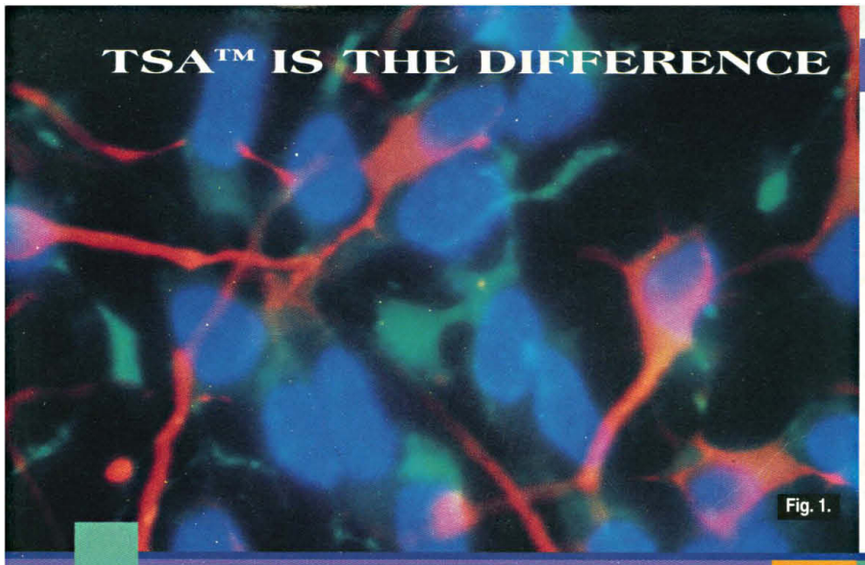

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Fig. 1. Multicolor detection using TSA-Direct.
Courtesy of Kevin Roth, M.D., Washington University School of Medicine, St. Louis, Missouri.

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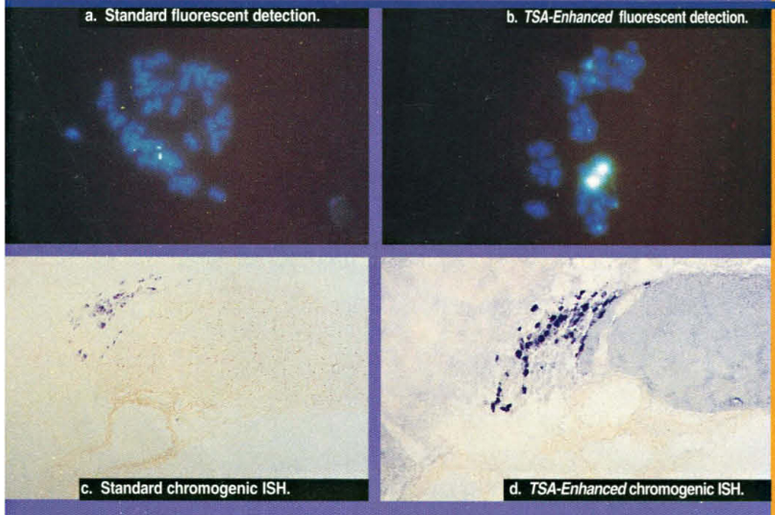
Fig. 2



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Figs. 2 a-b. Fluorescent detection of chromosome centromere probes in metaphase spreads.
Figs. 2 c-d. In situ chromogenic detection of oxytocin in rat brain tissue sections.

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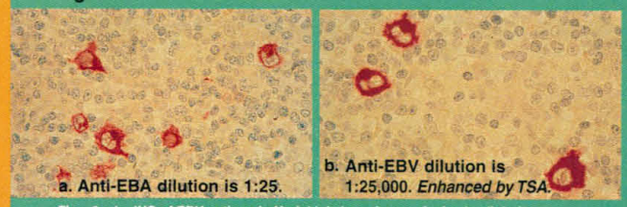
Fig. 3



Figs. 3 a-b. IHC of EBV antigen in Hodgkin's Lymphoma of mixed cellularity.
Courtesy of R. Von Wasielewski and S. Gignac, Pathologisches Institut de Medizinischen Hochscule, Hannover, Germany.

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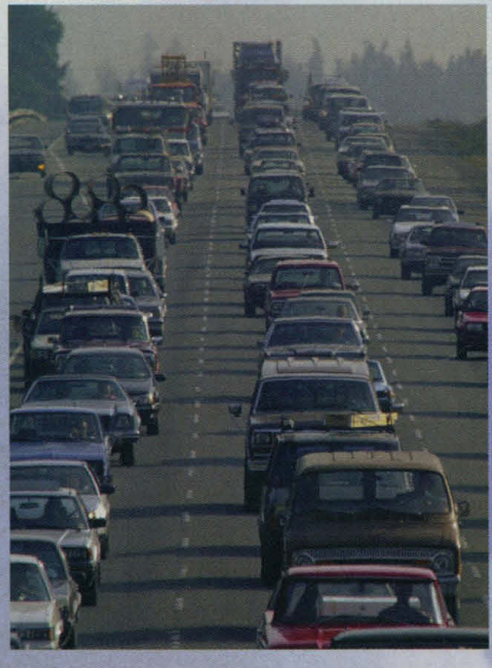

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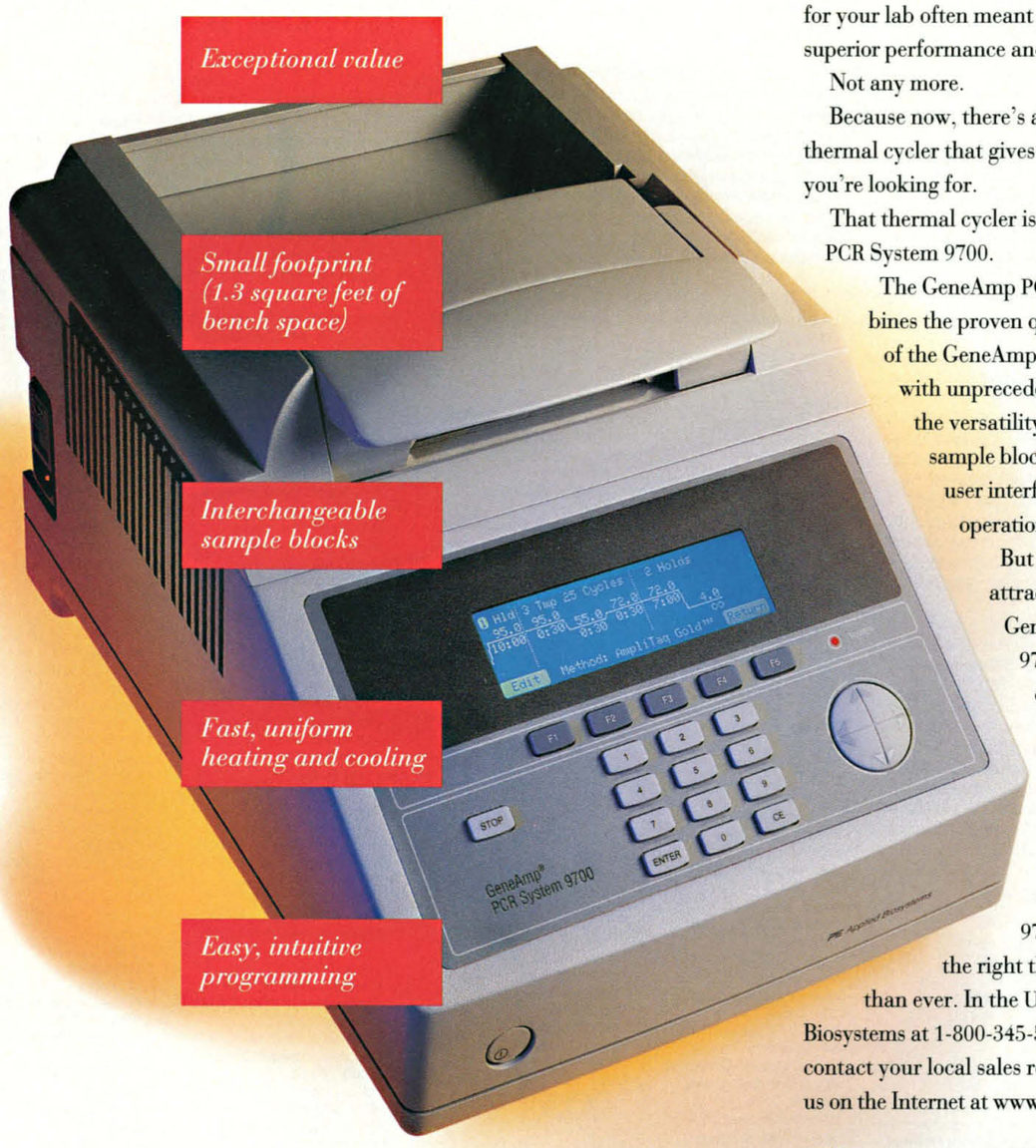

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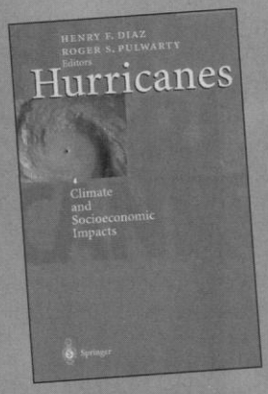

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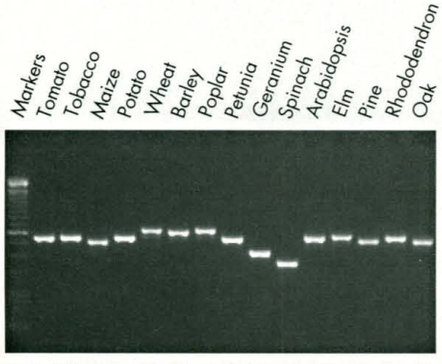

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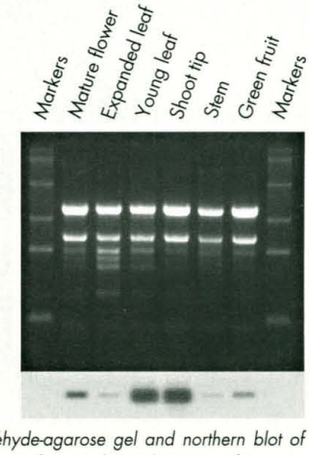

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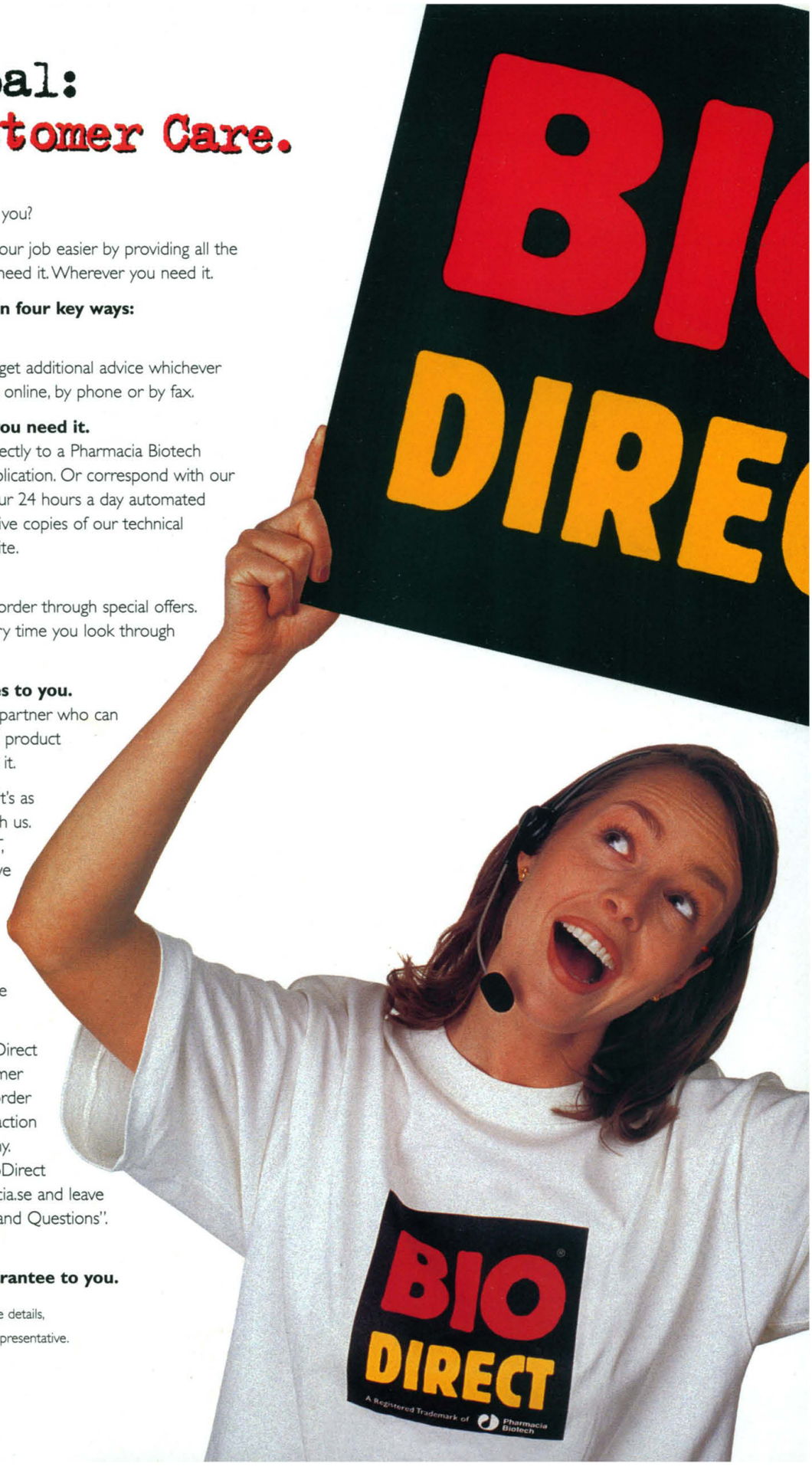

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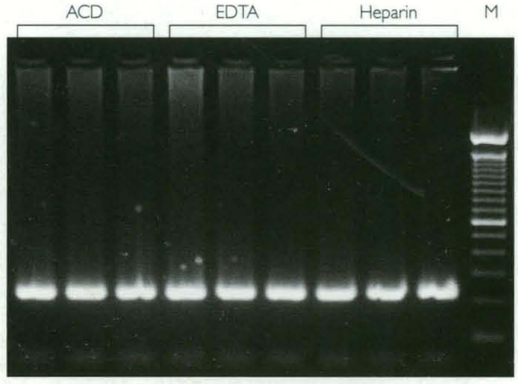

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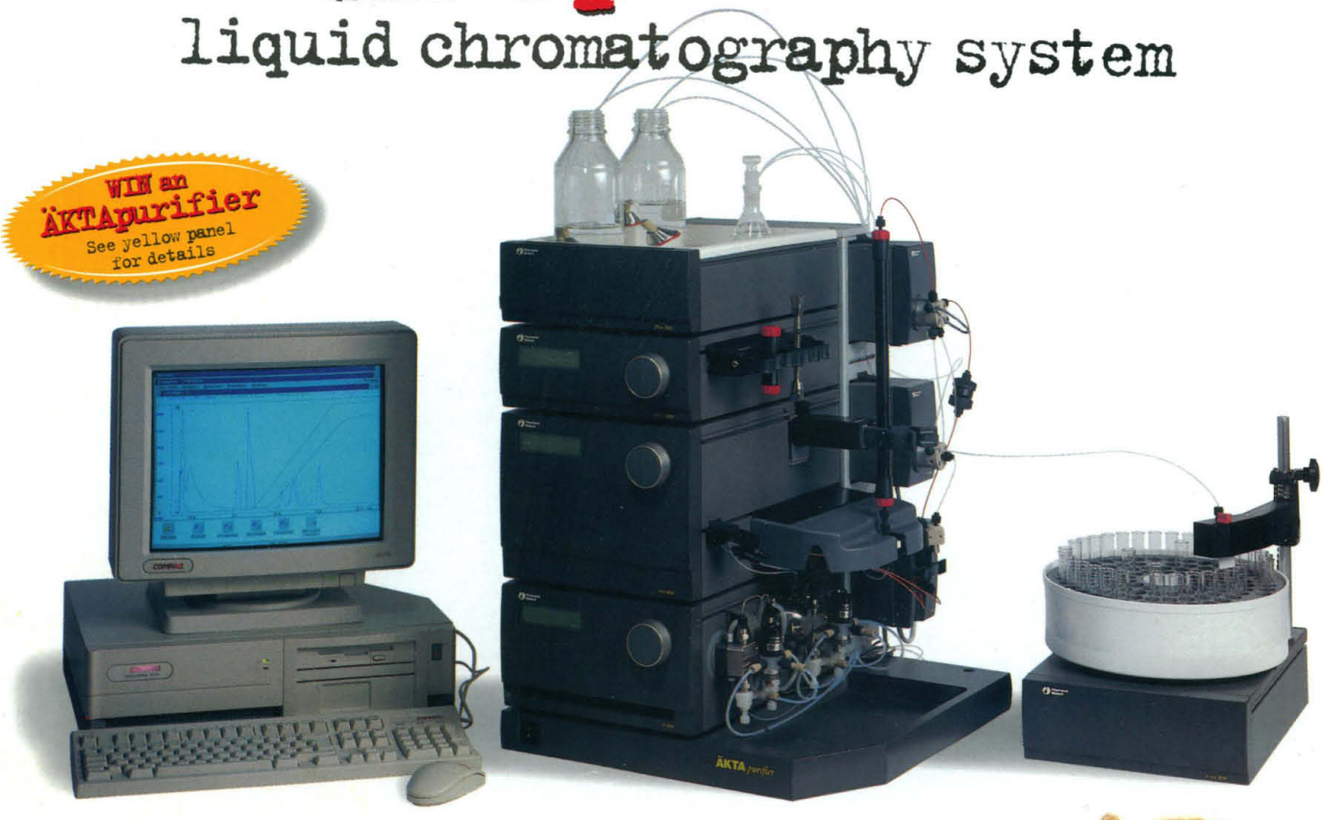

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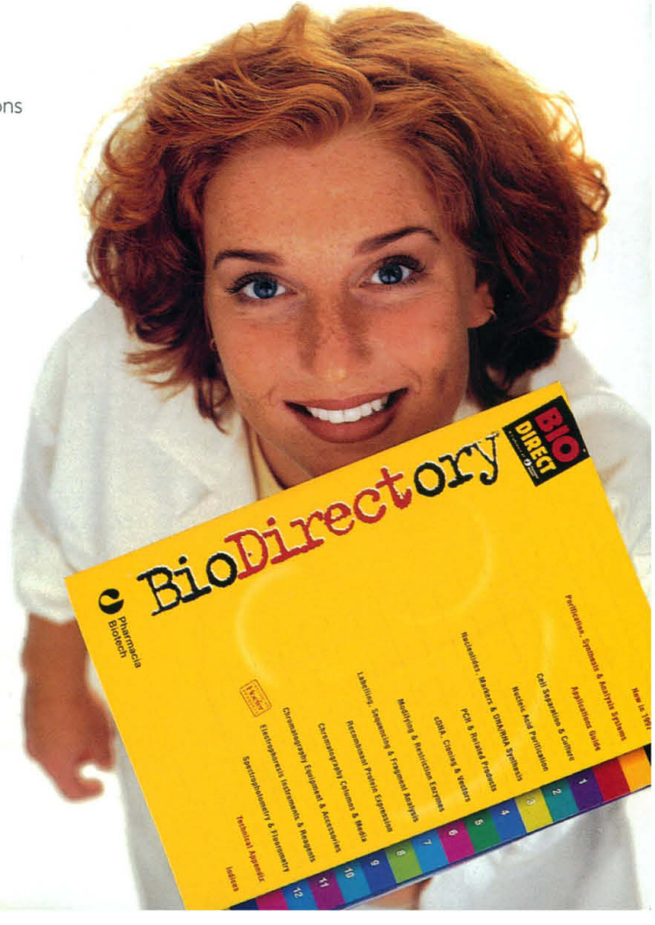

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Mini Q PE 4.6/50	1	15-0144-13	800
Mini S PE 4.6/50	1	15-0145-13	800
Superdex Peptide PE 7.5/300	1	15-0148-13	950

BioFAX documents: µRPC-18111945; Mini Q & S-18111947; Superdex-18111946

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ÄKTApurifier

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Drawing will be held November 20, 1997. For complete rules and regulations, see the prepaid reply card at the end of this supplement.

1. What is the fractionation range of the Superdex® Peptide range of columns?

2. Which Superdex Peptide column is recommended for use with ÄKTApurifier?

3. What is the working pH range of RESOURCE® RPC columns?

4. Which RESOURCE RPC column is recommended for rapid screening?

5. What is the maximum working pressure and suggested flow rate of the MiniBeads Q and MiniBeads S columns which are recommended for use with ÄKTApurifier?

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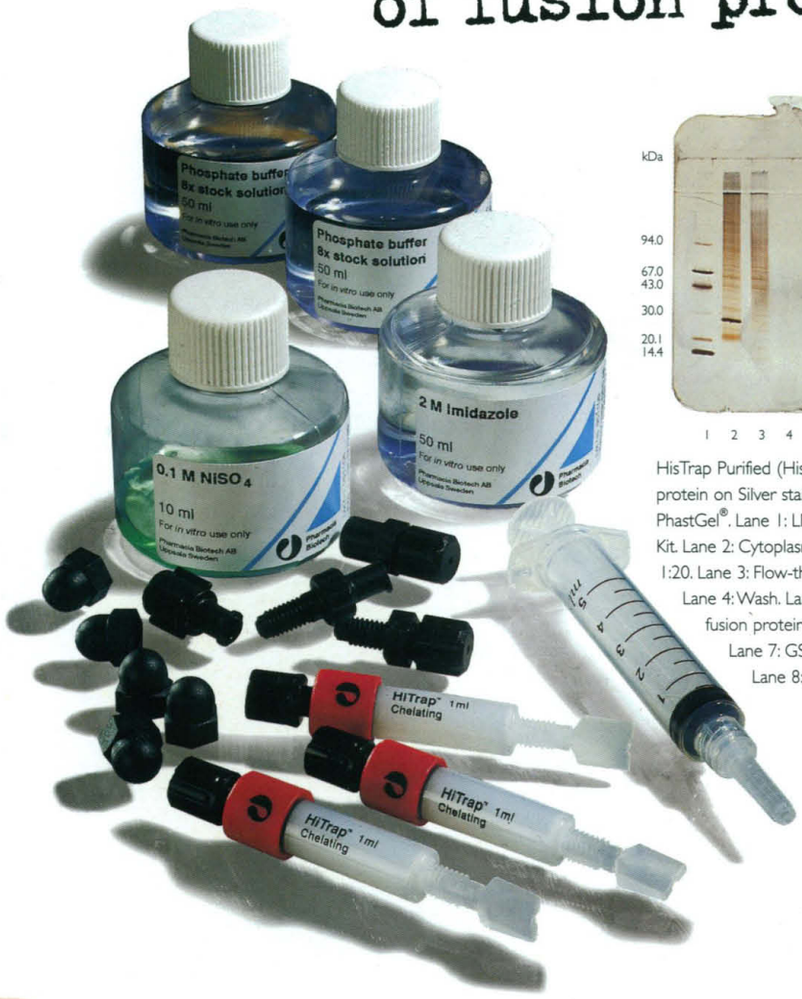
Selection Guide

Product	Separation Range (globular protein)	Bead size
Superdex Peptide	0.1-7 kD	13 µm
Superdex 75	3.0-70 kD	13 µm
Superdex 200	10.0-600 kD	13 µm
Superdex 30 prep Grade	<10 kD	34 µm
Superdex 75 prep Grade	3.0-70 kD	34 µm
Superdex 200 prep Grade	10.0-600 kD	34 µm

Product	Qty	Code No.	BIO DIRECT Price
G Superdex Peptide HR 10/30	1	15-0096-13	$985
Superdex 75 HR 10/30	1	15-0097-13	930
Superdex 200 HR 10/30	1	15-0098-13	940
Superdex 30 prep grade	25 ml	15-0090-13	70
	150 ml	15-0091-13	300
Superdex 75 prep grade	25 ml	15-0092-13	70
	150 ml	15-0093-13	300
Superdex 200 prep grade	25 ml	15-0094-13	70
	150 ml	15-0095-13	300
Gel Filtration Scouting Pack	3 x 25 ml	15-0066-13	210
includes: 1 each of Superdex prep grade			

BioFAX documents: Superdex HR 10/30-18111946; Superdex HR-18103411; Superdex pg-18106086

Fast, easy purification of fusion proteins



HisTrap Purified (His)6 fusion protein on Silver stained SDS-PAGE PhastGel®. Lane 1: LMW Calibration Kit. Lane 2: Cytoplasmic extract, dil. 1:20. Lane 3: Flow-through, dil. 1-10. Lane 4: Wash. Lane 5: (His)6 fusion protein, dil. 1:20. Lane 7: GST, 0.5 mg/ml. Lane 8: LMW.

HisTrap™ is a kit designed for rapid, mild affinity purification of histidine-tagged fusion proteins in one single step.

- The high dynamic capacity of HiTrap® Chelating columns enables milligrams of protein to be purified in less than 15 minutes at flow rates up to 240 column volumes per hour.
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The kit includes three HiTrap Chelating columns and buffer concentrates to perform 10-12 purifications.

- HiTrap Chelating (3x1 ml)
- Phosphate buffer, pH 7.4 (2x50 ml) (8x concentrate)
- 2 M Imidazole, pH 7.4 (50 ml)
- 0.1 M Nickel Sulfate (10 ml)
- Luter adapters, domed nuts, syringe and instructions

Product	Qty	Code No.	BIO DIRECT Price
HisTrap Kit	**10 purifications**	**15-0065-13**	**$125**

BioFAX document: 18121200

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Electrophoresis:

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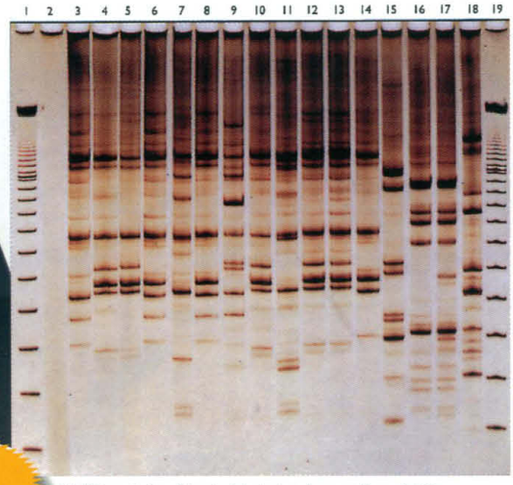

RAPD analysis of bacterial strains. **Lanes 1 and 19:** 100 ng 100 bp ladder; **Lane 2:** no DNA control reaction; **Lanes 3–14:** *E. coli* DNAs; **Lane 15:** *K. pneumoniae* DNA; **Lane 16:** *S. typhimurium* DNA; **Lane 17:** *E. aerogenes* DNA; **Lane 18:** *C. freundii* DNA.

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GenePhor EP Unit	1	15-0132-13		$2,950
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GeneGel Excel 12.5/24 Kit	1	15-0141-13		130
GeneGel Clean 15/24 Kit	1	15-0142-13		99
Offer valid May 16 - June 30, 1997.				

BioFAX document: 18111915

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Product	Qty	Code No.	BIO DIRECT	Price
Automated Gel Stainer	1	15-0140-13		$3,950

BioFAX document: 18111887

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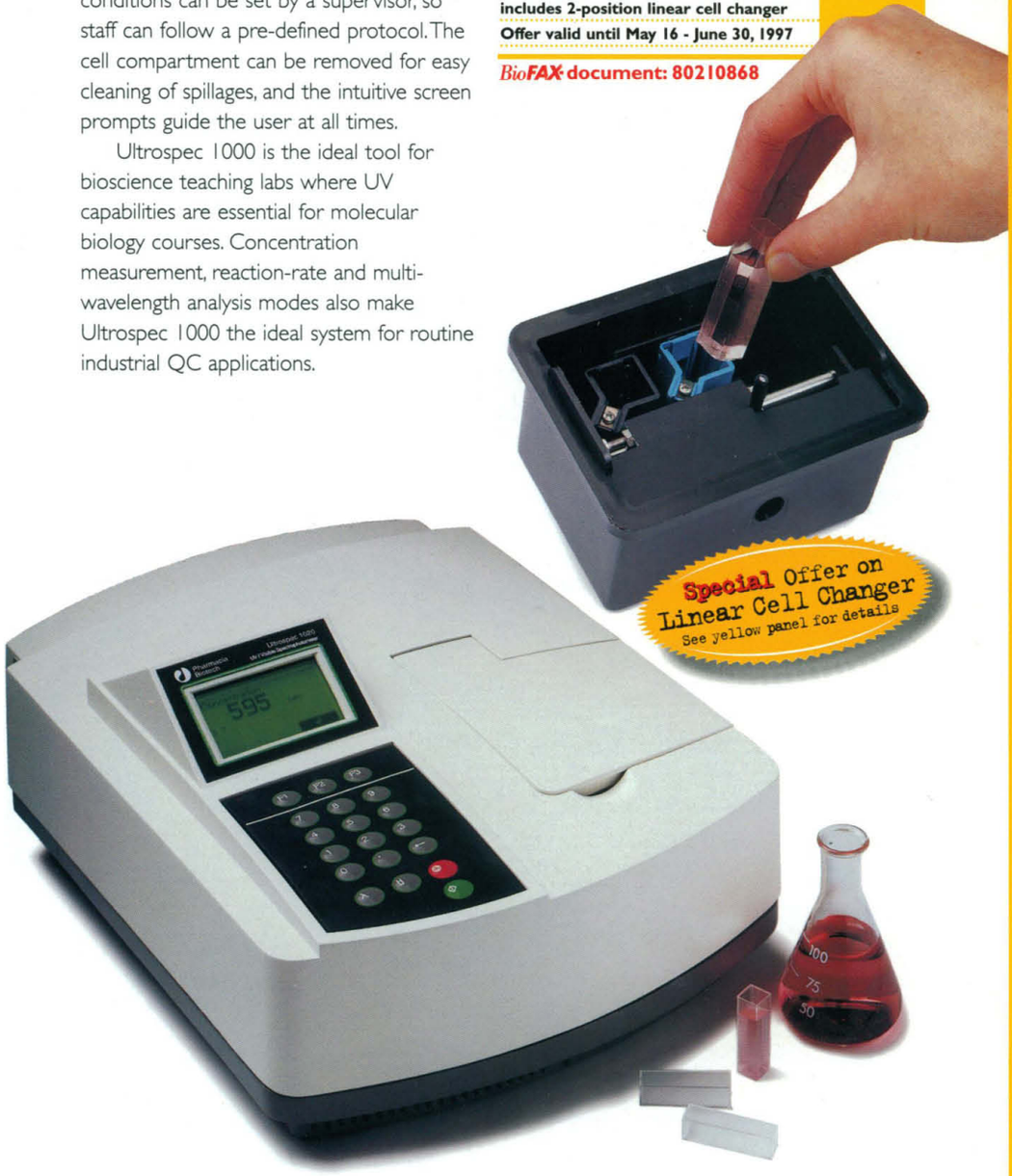
Product	Qty	Code No.	BIO DIRECT Price
Ultrospec 1000	**1**	**15-0137-13**	**$3,995**
includes 2-position linear cell changer			
Offer valid until May 16 - June 30, 1997			

BioFAX® **document: 80210868**



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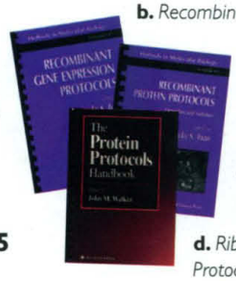

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